XXXIII CONFERENZA ITALIANA DI SCIENZE REGIONALI

# LOOKING FOR REGIONAL INNOVATION SYSTEMS IN ITALY: BEYOND THE THIRD-ITALY MODEL

Valentina DE MARCHI[1], Roberto GRANDINETTI[2]

## SOMMARIO

In letteratura, attraverso il concetto dei sistemi regionali dell'innovazione (RIS) si è discusso dell'importanza delle caratteristiche strutturali e istituzionali dei territori nel favorire lo sviluppo di innovazioni. In questo studio, si propone di verificare questa tesi nel contesto delle regioni italiane, verificando quali possano definirsi dei RIS, considerando per caratteristiche del tessuto imprenditoriale e il ruolo delle istituzioni. Per farlo, si è adottato un approccio quantitativo, dove la letteratura finora si è concentrata piuttosto su singoli casi esemplari, basandosi sui dati relativi all'ultima Community Innovation Survey (CIS) (relativa agli anni 2006-2008). Attraverso un'analisi cluster, si sono individuati quattro gruppi di regioni: le altamente innovative, i sistemi regionali dell'innovazione, le scarsamente innovative e le regioni arretrate. L'analisi suggerisce che solo alcune regioni siano riconducibili al modello dei RIS, ma che queste non siano le più innovative, proponendo una rilettura critica del concetto di RIS. Inoltre, si suggerisce che il modello delle "tre italie" è ormai superato, con la rottura soprattutto della cosiddetta terza-Italia: Veneto e Emilia-Romagna sono assimilabili e Piemonte e Lombardia, mentre le altre regioni del NEC presentano capacità innovative sensibilmente minori.

[1] Corresponding author. Department of Economics and Management "M. Fanno", University of Padova, via del Santo 33, 35123, Padova, E-mail: valentina.demarchi@unipd.it,
[2] Department of Economics and Management "M. Fanno", University of Padova, via del Santo 33, 35123, Padova, E-mail: roberto.grandinetti@unipd.it

## 1 Introduction

To ensure competitive advantages with respect to producers from countries that enjoy lower production costs and are increasing their manufacturing capabilities, firms specialized in low-tech manufacturing industries are the most challenged to introduce new products or improve their processes or organizational routines. In countries like Italy, hardly hit by the recession crisis and under pressure for the competition from developed countries, to understand how to foster innovation is getting a key priority. In innovation studies, the early Schumpeterian model of stand-alone developed innovations has been surpassed by the recognition that firms rarely innovate on their own: the knowledge and the capabilities of the network in which they are embedded and the underpinning institutional framework have a strong influence on their innovation performance. Theoretical and empirical contributions suggest that, even in the era of globalization, innovation spillovers and technological accumulation is highly concentrated at the geographical level, fostering the need to analyze context-specific factors other than firm's specific characteristics to understand the development of technological performance. Even if country-specific factors – summarized in the concept of national innovation system (Freeman, 1987; Lundvall, 1988) – are still very important, scholarly and policy maker attention move more recently toward the region as "the level at which innovation is produced through regional network of innovators, clusters and the cross-fertilizing effects of research institutions" (Lundvall and Borrás, 1998, p. 39). Focusing on the experience of exemplar regions such as the Baden-Württemberg in Germany contributions in the regional innovation system (RIS) literature have suggested that the deep differences in innovation performance among regions may be explained by the peculiar combination of firm's strategies and characteristics together with the institutional framework, the role of public policies and research institutions and the nature of their relationships (Cooke, 2001; Asheim *et al.*, 2011).

Despite the literature on RIS have flourished since the concept was first developed in the 1990s (Cooke and Morgan, 1994), contributions attempting to evaluate quantitatively which regions can be considered RIS are still very scant, whereas the great majority of the studies on the topic so far have rather adopted a qualitative approach, studying single exemplary cases. More precisely, "much of the existing literature has focused on highly successful RIS and on regions characterized by a prevalence of medium- to high-technology industries" (Asheim *at al.*, 2011, p. 881). This paper aims at exploring innovation patterns of Italian regions, assessing whatever RIS of any of the types identified in the literature can be found. Having the region as the level of the analysis, such exploration appears of the greatest importance to understand innovation performance of countries characterized by a high internal heterogeneity, like Italy. If it is common knowledge that Italian productivity has declined in

the last decade, there is also evidence that this decline has not occurred homogenously across regions (Dettori *et al.*, 2012). In the past, North-western regions have been the only Italian regions considered as RIS, for their higher technological performance and the systemic interactions as opposed to the regions of the South and the Center considered rather backward as far as innovation capabilities and systemic interactions are concerned (Evangelista *et al.*, 2002; Iammarino, 2005). The North-eastern and the Center regions, such as Veneto, Emilia-Romagna and Toscana where somehow in the between, being characterized by good and diffused innovative capabilities at firms that were not supported by a strong regional innovation system in the form of R&D infrastructures and business-universities interactions. If there is evidence that several important socio-economic transformations have taken place in Italian regions in the last decade (De Marchi and Grandinetti, 2012), no study so far has attempted to analyze if the geography of RIS in Italy has changed. How have the innovation capabilities of Italian regions evolved since then? Leveraging on the recently-released Community Innovation Survey (CIS) data on 2008, we contribute to the literature by providing a fresh analysis of innovation in Italian regions and by verifying the existence of RIS based on evidence on innovation performance, on the relevance of systemic interactions and on firm's R&D strategies.

## 2 Regional innovation systems: a critical literature review

### *2.1 Defining regional innovation systems*

The concept of regional innovation system (RIS) is pretty recent, representing an attempt to apply the previous concept of national innovation system (NIS) on a smaller and more homogeneous level. The expression "national system of innovation" was coined almost contemporary by Christopher Freeman (1987) and Bengt-Åke Lundvall (1988); the first in the attempt to interpret the success of the Japanese economy, the second interested in explaining innovation of firms as an interactive process involving a wide network of relationships. In particular, Freeman (1987, p. 1) defines it as "the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies". The literature on NIS got fast influential in the 1990s, suggesting that factors characterizing the nation-wide context are important determinants of the innovation and growth performance of firms. In particular, NIS scholars highlighted the important role of a shared culture, the political and institutional context and the interactions between firms and knowledge providers, such as universities, in supporting the reciprocal learning and the innovation capability of firms (Lundvall, 1992). The NIS approach has been used to study countries being also very different one from the other, like Denmark and the USA (Nelson, 1993). Freeman (1995) deepened the concept in a historical perspective by using the examples

of countries such as Japan, Germany and the former USSR. While supporting the importance of country specific factors in explaining firm's innovative behavior, the author aims at supporting the concept of competitive advantage of nations by Porter (1990) and contrasting the thesis of globalization as a process that dissolve national specificities, which authors like Ohmae (1990) were promoting in the same years. After few years, however, the regional dimension emerges as an equally important if not more important dimension to understand innovation and its promotion (Howells, 1999). In fact, on the one hand, scholars got aware that nation-states were loosing their importance in the globalized economy (Chung, 2002). On the other hand, it appeared clear that the concept of NIS was not suit to capture the systemic nature of innovation processes due to the internal differences characterizing large and heterogeneous countries such as Germany or Italy. The study by Cooke and Morgan (1994) on one of the strongest regional economies in Germany, the Baden-Württemberg, was one of the first studies to support the view that the application of the NIS concept at the regional level could have offered a more appropriate instrument to understand innovation performance. In fact, in their study they explain the success of this region based on three elements: dynamic vertical and horizontal networks between firms, a rich institutional system of vocational training, and substantial public and private investment in R&D, innovation and technology transfer.

RIS has been defined as "the *localized* network of institutions in the public and private sectors whose activities and interactions generate, import, modify and diffuse new technologies" Evangelista *et al.* (2002, p. 174), applying therefore the definition of NIS by Freeman (1987) to the regional level. Iammarino (2005, p. 499) adds "*within and outside the region*" to this definition, signaling that RISs are usually open systems, while Tödtling and Trippl (2011) emphasis that they are made by two interacting subsystems: the firms and their business relationships and the institutions producing and diffusing knowledge, like universities and research centers. A key characteristic of RIS, as they are conceptualized and measured in most of the scholarly articles, is that innovation – considering for both radical and incremental improvements and for non-technological innovations – is to be understand as taking place within a system, therefore considering for a whole series of actors involved and for the interactions among them (Cooke *et al.*, 1997; Doloreux, 2002). Other than the firms, RIS are constituted by knowledge infrastructures – including also the financial system – policies oriented to increase regional learning capabilities and supporting the development of knowledge and of new and profitable industrial activities, and institutions supporting the development and diffusion of knowledge and innovation (Doloreux, 2002). Other than universities and public research centers, business service firms specialized in the provision of knowledge-intensive services (KIBS) have been recognized as economic actors that can play a crucial role in the development of RIS, given their ability to produce knowledge and transfer it to other players in the same areas (Muller and Zenker, 2001; Cooke and Leydesdorff, 2006;

Bettiol *et al.*, 2012). Within RIS information and knowledge circulate among those actors fostered by geographical and cultural proximity, enabling a process of interactive learning (Cooke *et al.*, 1997). The whole point in the RIS literature is that the presence and the actions of those actors and the systems of complex relations that connect them create a favorable context for the development of knowledge and innovation, which may then be capitalized by firms through the development of new products or processes. In this sense, regions work as knowledge accumulators, which favor the interactive learning among actors that are directly or indirectly embedded in the productive processes (Cooke *et al.,* 1997)

### *2.2 Different types of RIS*

The empirical and theoretical literature on RIS has disclosed the existence of different types of RIS, representing different combinations of characteristics of the productive system and of the institutional context that promote localized learning and positive externalities for innovation activities. Based on the analysis of Scandinavian regions, Asheim and Isaksen (2002) and Asheim and Coenen (2005) proposed an interesting classification of RIS, based on the type of collaboration existing among RIS actors and on the type of knowledge that is used and developed. According to this classification, it is possible to distinguish among three models: i) the territorially embedded regional innovation systems; ii) the regionally networked innovation systems, and iii) the regionalized national innovation systems. In *territorially embedded RIS*, similar to what Cooke (1998) calls "grassroots RIS", firms base their innovation activities on localized learning, thanks to frequent inter-firm interactions favored by geographical and cultural proximity. On the contrary, interactions with knowledge generating organizations like universities and public research centers are rather infrequent. Innovations generated, mostly incremental, are based on tacit and synthetic knowledge – meaning applied and problem-solving oriented knowledge – and imply the combination of existing knowledge into novel ways rather than the development of new knowledge. Asheim and colleagues suggest that Emilia-Romagna and the Third Italy regions, characterized by the presence of Marshallian industrial districts, may well typify this RIS type. Regionally networked innovation systems or "network RIS" (Cooke, 1998) are considered the "typical RIS". In addition to the intense inter-firms relationships, in those RIS collaborations with knowledge generating institutions are very important and are often the result of an intended policy action aiming at strengthening the regional infrastructure and the effectiveness of its action. In those RIS, policy intervention supports innovative activities of firms through technology transfer offices, by providing incentives for innovation and other services. Innovation is based both on synthetic and analytic (i.e., codified and scientific-based) knowledge. Some regions in Austria, Germany and the Nordic countries are the archetype of this type of RIS. Also in regionalized NIS, or "dirigist RIS" in Cooke's (1998) words, public

and private interactions are important, but are more likely to involve institutions located outside the region. Furthermore, where in typical RIS (regionally networked) university-firms cooperation is market-driven, in regionalized NIS it is rather science-driven. Knowledge flows are rather linear and cooperation is often aiming at introducing radical innovations based on analytic knowledge and involving firms with strong R&D capabilities. In short, such RIS are functionally integrated in, or equivalent to, NIS.

Despite this classification got fast diffused in the literature, by now it has not been supported by an adequate empirical proof. The existence of different varieties of RIS is still an open issue, and so is the capability of each type to produce a regional competitive advantage, as is suggested by Asheim *et al.* (2011) in the introduction of a recent special issue on RIS published in *Regional Studies*. Moreover, it is important to notice that not all regions may qualify as RIS: a minimum threshold of innovative actors (both firms and institutions) and of interactions among them has to be present (Evangelista *et al.*, 2002). For instance, Cooke et al. (2000) examined 11 European regions to establish the extent to which RIS exist, finding that only 4 of them were good candidates. Unfortunately, almost no empirical study has attempted to verify how many of the regions of countries may qualify as (any of the type of) RIS, whereas the majority of studies have focused just on first-rate cases as Baden-Württemberg in Germany, Wales in UK and Emilia-Romagna in Italy, to focus on the EU (Cooke and Morgan, 1998; Cooke, 2001; Doloreux and Parto, 2005). Our paper and those by Evangelista *et al.* (2002), both focused on the Italian context, are the only attempts, to the best of our knowledge, to quantitatively investigate which regions within one single country can be considered RIS and which do not qualify for this label, despite hosting innovative firms or other institutions.

## 3 The empirical setting

As said, so far, studies investigating RIS employed mainly a case study approach (see e.g., Asheim & Coenen, 2005; Asheim & Isaksen, 2002; Cooke & Memedovic, 2003; Iammarino, 2005) and focused on single regions at a time, with fewer example of quantitative analyses (see Navarro, Gibaja, Bilbao-Osorio, & Aguado, 2009). Such methodology allows a deep understanding of RIS transformations and of the role of specific geographical and historical conditions to support their evolution, but it prevents from replicating the results within other contexts. Furthermore, through this methodological approach scholars have focus mainly on regions that has been *a priori* identified as RIS. In this study, we rather employed a quantitative approach, in the effort to verify which regions may qualify as a RIS. We employed the same methodologies adopted by Evangelista et al. (2001, 2002), in the sole study that attempted to measure quantitatively the existence of RIS in the Italian setting. By replicating their analysis, which employed data on the early 1990s, on more recent data, our

analysis will allow also comparing the evolution of the innovative capabilities of regions across the latest two decades. A number of practitioner and academic studies have analyzed the innovation capabilities of Italian regions, but, again, focusing just on one region at a time and focusing mainly on Northern regions. Lombardia has been the most studied region (Malerba, 1993; Bosco, 2007), but there are studies focusing also on other North-western regions like Piemonte (Miglietta, Peirone, & Servato, 2011), North-eastern regions like Emilia-Romagna (Mazzanti & Pini, 2011), Friuli-Venezia Giulia (Cariola & Coccia, 2002) and Veneto (De Marchi, 2012), plus on the most dynamic regions in the center of Italy like Toscana (Bacci, 2009) and Marche (Fondazione Aristide Merloni, 2011)

As Evangelista *et al.* (2002) we base our analysis on data from the Italian community innovation survey (CIS) (5th wave), which is carried out every two years by the Italian national statistic institute (ISTAT) and is based on the Oslo manual guidelines on innovation. CIS surveys, carried out in all EU countries are very diffused in innovation studies (De Marchi, 2012) and are considered among the most comprehensive data source on innovation at the regional level (Evangelista *et al.*, 2001). Differently from patent data, CIS data allows studying both radical and incremental innovations and organizational and marketing other than technological innovations. CIS data contain information on companies' structural characteristics, R&D strategies and innovative activities over a 3-years period (2006-2008). The Italian CIS survey covers innovation activities of enterprises with at least 10 employees in the ATECO2007 sectors B-N (both manufacturing and services); data were collected through census survey for firms with more than 249 employees, and through sample survey for the others, based on a stratified random sample, identified through the industry specialization, the size of the firms and its geographical location[3]. Starting from the 19,904 enterprises included in the final sample, we restricted the analysis just on small and medium sized firms (firms with 250 employees or less), being left with 18,132 observations[4]. The majority of firms are specialized in the service industry (54.2%) – among which the 3.1% are Knowledge Intensive Business Services (KIBS) – or in the manufacturing (41.0%), whereas just a minority is specialized in other industries (1.7%). The geographical location of innovative activities is measured at the regional level, that is at the NUTS 2 level.

## 4 The innovative capabilities of Italian firms across regions: an historical perspective

[3] More information on the Italian CIS survey may be found at http://www.istat.it/it/archivio/18776

[4] As reported in Evangelista *et al.* (2001), one of the limitation of the CIS is that it reports data on the region where the main facility of the firm is located, which, in the case the firm has more than one production unit may not necessarily coincide with the location where innovation activities are carried out. To bypass such a limitation, following the indication by Eurostat, we decided to focus the analysis just on small or medium-sized firms (SME), which are the least likely to have multiple locations, and which represent the 98,6% of the initial sample.

In its historical analysis of Italian regions' innovation capabilities, Iammarino (2005) analyses four major clusters of regions, corresponding to the macro-regions traditionally used to analyze the country, the North-West, the NEC (North-East and part of the center of Italy), and the center and south regions. By the mean of an historical narrative, the author suggests that Northwestern regions, including Piemonte, Lombardia, Liguria and Valle d'Aosta, are the only that qualify as RIS. Geographical and historical factors spurred the industrial development in those regions much earlier than and the rest of the country, which transformed this area into what Iammarino (2005:18) defines the "technological heart of Italian industry". The lively and dynamic cultural environment and the presence of important universities, supported the development of a good scientific and technological infrastructure and of structured firms-universities relationship. Also the Northeastern regions – including Veneto, Friuli-Venezia Giulia, Trentino Alto Adige and Emilia-Romagna – plus Toscana, located in the Center of Italy, are identified as innovative regions, named by Iammarino (2005) the *learning regions*. Having been characterized by a specialization in primary or tertiary economic activities, in the late 20$^{th}$ century they rapidly transformed into very industrialized and entrepreneurial regions, characterized by the presence of an high number of SME localized in industrial district specialized in low-tech industries. Regions such as Veneto, Emilia-Romagna and Toscana got internationally well known as the archetype of the so-called "Third-Italy" model. Where in the North-western regions it is suggested that innovation was mainly R&D-driven and supported by strong private and public research institutions, in such regions innovation is rather driven by inter-firms user-producer interactions, thanks to the presence of informal networks favored by spatial proximity, but the public R&D infrastructure is rather weak (Iammarino, 2005). Finally, the remaining regions, located in the center and in the Mezzogiorno (the south of Italy plus the islands) are not considered eligible for the definition of regional innovation systems, but are defined rather technologically backward or conservative. Their innovation strategies are imitative in nature and isolated within the regional context, characterized by the absence of any systemic dimension.

The most recent analysis by Evangelista *et al.* (2002), using a quantitative analysis based on data on the early 1990s' report a similar analysis as for the Northwest and the center-south regions, whereas a more differentiated picture emerges when considering the North-East regions. Also in their analysis, they identify northwestern regions – together with Lazio where the capital city and a major part of public R&D infrastructures and activities are located –as the only RIS in Italy[5]. The authors define such regions *science-based systems*, being the most R&D intense regions in Italy and being characterized by the presence of several universities and public and private research institutions and of large-sized firms, often specialized in medium and high-tech industries. Their data analysis suggests that in such regions

[5] The authors consolidated data on Valle D'Aosta with those of Piemonte, presumibly because of the low number of data available for this region, which is the smallest and least populous region in Italy.

interactions among the RIS actors are pretty strong, even if not homogenously distributed in all regions and innovation policies play an active role. Differently from Iammarino (2005) they suggest the existence of two different groups characterizing the North-Eastern and center regions; Emilia-Romagna and Toscana are defined *informal learning systems*, representing a grass rote example of RSI, whereas Veneto and Friuli-Venezia Giulia, together with Umbria, Marche, Basilicata and Calabria, can not be considered proper RISs and are rather defined *weak innovation systems*. The authors, in fact, suggest that, if there is evidence of diffuse innovation capabilities, the systemic character of innovation is rather weak, being characterized by a weak technological and R&D infrastructure (both private and public), by poor interactions if not inter-firm and by a technological self-reference. Recent evidence on transformations taking place in the Northeastern regions suggests that this picture may have changed again. By the mean of a review of recent contributions and of original data, De Marchi & Grandinetti (2012) suggest that several transformations have affected such regions – including the move toward innovations based on codified and complex knowledge rather than tacit and contextual one and the increasing importance of (knowledge intensive business) services rather than manufacturing firms for the overall economy – which makes them increasingly similar to Northwestern regions.

## 5 The innovative capabilities of Italian regions nowadays

Table 1 presents the number of firms active in each regions and the percentage of firms in the region having introduced at least one product, process, organizational or marketing innovation. Differently from Evangelista *et al.* (2002), which focus just on technological innovations, this analysis will allow a broader comprehension of regional innovative capabilities considering also for organizational and marketing innovations, which are getting increasingly relevant and contributing considerably to the value added of products in developed economies, given the increasing importance of non-material features of the product. When in Evangelista *et al.* (2002) regions within the same macro area (North-West, North-East, Center and Mezzogiorno) was pretty homogeneous as for incidence of firms having introduced (technological) innovations, in this analysis much starker differences emerge. As emerges from Table 1, Northern regions, especially Lombardia, Veneto, Trentino Alto Adige and Emilia-Romagna are those characterized by the highest number of firms, but not by the same level of innovativeness. If we look at the second column of Table 1, reporting the percentage of firms in the region that has introduced at least one product, process, organizational or marketing innovation, we see that Emilia-Romagna and Veneto are the only regions for which more than half of the firms (51.3% and 50.3% respectively) are innovators, according to the definition just provided, followed by Lombardia (48.6%) and Friuli-Venezia

Giulia (46.6%)[6]. As expected, Northern regions are ranking the highest as far as the propensity to innovate is concerned, whereas Southern regions rank the lowest, but interesting exceptions emerges. Piemonte, for example, which has been traditionally associated with high investments in R&D and high innovative and patenting capabilities, scores just fifth as for presence of innovative firms, just above Puglia, located in the South of Italy, which represents the most innovative region of the Mezzogiorno. Another interesting evidence regards Liguria and Valle D'Aosta, both located in the North-West of Italy, which are at the end of the table, together with Molise (Mezzogiorno), with just one third of the firms having introduced any innovation in the period 2006-2008. If the result for Valle D'Aosta may be explained with the prevalence of firms specialized in the service industries rather than in manufacturing – a sector traditionally associated with lowest level of innovativeness – the innovative performance of Liguria is rather surprising, if compared to what emerges from previous studies, including Evangelista *et al.* (2002), in which it was considered, together with Piemonte and Lombardia, one of the most important industrial area in Italy. This result may be explained with the progressive de-industrialization of the region, which may have weakened the local production tissue and its innovative competences.

Table 1 report the presence of innovators considering for different typologies of innovations, namely product, process, organizational and marketing innovation, which allow identifying relative advantage of regions and consider for the specificity of each of the typology of innovation considered. In general, organization innovations are the most diffused in Italy (26.5% vs. 21.7% of product innovations, the least diffused). The relative performance of the regions across each typology of innovation are similar to those presented, but with interesting exceptions. Lombardia holds a record for the diffusion of organizational innovations (being introduced by 30.1% of the overall firms in the region), whereas Emilia-Romagna and Piemonte rank first as for product and process innovations respectively (25.8% and 29.6%). Veneto, located in the North-East of Italy, is the region with the highest incidence of firms having introduced marketing innovation (28.0%), which is consistent with the traditional view of the region as focused mainly on incremental innovations aimed at improving and customizing the product (see e.g., Malerba, 1993). It is interesting to note that it is the only region that ranks among the first four in all the typologies of innovations considered: this is not the case for other very innovative regions like Lombardia, which ranks just 8$^{th}$ as for incidence of marketing innovators of Emilia-Romagna, which ranks 10$^{th}$ and 7$^{th}$ on organizational and marketing innovations, respectively. This evidence suggest that the high innovation propensity of the region is driven by the existence of multifaceted innovative capabilities rather than a deep yet narrow specialization in some typologies of innovations. On the contrary, regions like Puglia, located in the South of Italy, show a relative specialization in

[6] The descriptive statistics presented can be considered a reliable representation of the entire population of Italian firms rather than just of the sample of interviewed firms, given that sampling weights (considering the geographical location, the dimension and the sectoral specialization) have been used.

marketing innovations, introduced by 27.5% of the firms, whereas for all the other typologies except organizational innovations it is characterized by less than average diffusion rates. Similarly, Lazio, Basilicata and Umbria present a relative specialization in organizational innovations (introduced by 29.0%, 28.2% and 28.1% of the overall firms, respectively), very close to the 30.1% characterizing the first scoring region, Lombardia.

*Table 1 - Innovative firms by region, ranked by the incidence of firms having introduced at least one innovation during 2006-2008*

| | Number of firms | % of firms in the region that have introduced: Any innovation | Product innovation | Process innovation | Organizational innovation | Marketing innovation |
|---|---|---|---|---|---|---|
| Emilia-Romagna | 1,459 | **51.3%** | **25.8%** | 24.7% | 25.8% | 25.1% |
| Veneto | 1,935 | 50.3% | 25.1% | 27.9% | 29.6% | **28.0%** |
| Lombardia | 4,328 | 48.6% | 25.5% | 28.8% | **30.1%** | 24.4% |
| Friuli-Venezia Giulia | 551 | 46.6% | 24.1% | 26.5% | 24.8% | 26.9% |
| Piemonte | 1,088 | 46.1% | 24.5% | **29.6%** | 28.2% | 23.1% |
| Puglia | 839 | 45.9% | 20.0% | 23.0% | 28.1% | 27.5% |
| Trentino Alto Adige | 1,519 | 45.6% | 21.6% | 24.1% | 25.4% | 27.6% |
| Lazio | 1,360 | 45.1% | 18.8% | 21.6% | 29.0% | 25.6% |
| Marche | 562 | 44.2% | 21.2% | 22.0% | 26.1% | 25.2% |
| Umbria | 369 | 42.8% | 19.3% | 22.2% | 28.1% | 19.2% |
| Toscana | 1,230 | 41.3% | 18.1% | 18.9% | 22.3% | 22.5% |
| Basilicata | 208 | 40.3% | 17.9% | 23.8% | 28.2% | 17.6% |
| Abruzzo | 286 | 39.6% | 16.5% | 16.0% | 19.9% | 19.7% |
| Sardegna | 410 | 38.4% | 18.7% | 21.4% | 24.9% | 20.3% |
| Campania | 520 | 36.3% | 13.7% | 14.9% | 22.2% | 20.9% |
| Calabria | 234 | 35.8% | 16.3% | 17.8% | 25.9% | 22.1% |
| Sicilia | 494 | 35.7% | 17.0% | 17.3% | 17.3% | 19.7% |
| Liguria | 494 | 35.5% | 11.3% | 15.6% | 19.4% | 18.9% |
| Valle D'Aosta | 111 | 34.7% | 14.4% | 11.6% | 20.9% | 16.3% |
| Molise | 135 | 34.6% | 13.7% | 14.0% | 19.3% | 12.2% |
| *Italy* | *18,132* | *45.2%* | *21.7%* | *23.9%* | *26.5%* | *24.1%* |

Table 2 reports the relative importance of different activities pursued by firm to develop innovations, considering for the diffusion of in-house R&D activities, the adoption of any innovation input and for the average amount of resources devoted to innovation activities. According to the CIS questionnaire, innovation activities and input regards, other than the i) in-house R&D, ii) the acquisition of R&D performed by external organizations, iii) the acquisition of machinery, equipment and software, iv) the acquisition of other technologies in the form of patents, know-how or other types of knowledge from external organizations; v) design and product development; vi) personnel training for innovative activities, vii) activities linked with the market introduction of the innovation. Being the first region for presence of innovators, Emilia-Romagna is also the first for incidence of firms that have invested in any innovation activity during 2008 (38.4%), a percentage very close to that of Lombardia (37.6%) and Piemonte (36.9%), even tough, on average, its firms devote a smaller amount of resources to such inputs (80,79 thousand € vs. 95,81 of Lombardia, the regions investing the most on innovation). This evidence suggest that in this Northeastern region innovation and R&D capabilities are diffused but they are rather small in scale, with may be explained also

with the fact that a great majority of such firms are small. Again, southern regions are those displaying the lowest performance according to this indicator, with the exception of Puglia (31.1%). A similar picture emerges when we consider the diffusion of the sole R&D activities. Again, it can be noted that there are deep heterogeneities across regions in terms of the diffusion of firms that develop internally creative work to increase the stock of knowledge for developing new and improved products and processes. Against a group of active regions characterized by almost 15% of firms carrying out in-house R&D, even if on an occasional basis (namely Emilia-Romagna, Lombardia, Piemonte and, to a lower extent, Veneto) there is a clear group of laggards (being Campania, Basilicata, Liguria, Sardegna and Sicilia), whose incidence is almost one fourth than the most R&D intense regions. Interestingly, if Liguria is characterized by a lower-than-average diffusion of firms performing R&D and other innovation activities, their relative investments are rather high, suggesting the presence of few yet large innovation and R&D-intense firms.

*Table 2 Diffusion of R&D activities and other innovative inputs across Italian regions (2008)*[a]

| | % firms with R&D | % firms investing in innovation activities | Innovation expenditures |
|---|---|---|---|
| Lombardia | 15.0% | 37.6% | **95.81** |
| Emilia-Romagna | **15.6%** | **38.4%** | 80.79 |
| Piemonte | 14.8% | 36.9% | 85.65 |
| Veneto | 13.6% | 36.0% | 87.55 |
| Trentino Alto Adige | 10.0% | 33.7% | 83.17 |
| Friuli-Venezia Giulia | 9.0% | 34.6% | 81.14 |
| Marche | 10.3% | 33.5% | 59.10 |
| Toscana | 10.7% | 27.2% | 64.75 |
| Lazio | 7.7% | 30.1% | 65.02 |
| Umbria | 8.7% | 29.7% | 50.76 |
| Puglia | 6.9% | 31.1% | 43.45 |
| Abruzzo | 10.3% | 26.8% | 33.21 |
| Sicilia | 4.9% | 24.8% | 46.64 |
| Sardegna | 4.8% | 28.8% | 38.66 |
| Liguria | 4.4% | 21.8% | 63.46 |
| Basilicata | 4.5% | 28.9% | 30.57 |
| Calabria | 6.5% | 21.1% | 36.96 |
| Valle D'Aosta | | 22.0% | 34.23 |
| Campania | 4.3% | 20.8% | 34.94 |
| Molise | | 22.3% | 29.75 |

[a] Data on R&D diffusion for Valle D'Aosta and Molise could not be reported because of privacy concerns by ISTAT, given the low number of firms having such activities.

## 6 Looking for regional innovation systems among the Italian regions

If the previous paragraphs have marked the high differences in innovation activities and performance across regions and suggested that they changed over time, with respect to what was suggested in analysis considering data on the early 1990s, in this paragraph we set out to take the discussion a step forward identifying common pattern across regions and verifying if any of the Italian region may be classified as a RIS of any of the type described in the

literature. For the purpose of comparing the results of this analysis with those emerging in the analysis by Evangelista *et al.,* (2002), therefore allow studying the evolution of regional innovation performance across time, we adopted the same methodology used in that study. As a first step, we conducted a factor analysis using the principal component analysis method, a methodology that aims at identifying factors representing and summarizing a larger number of correlated variables. Such methodology is preferred when data reduction is a primary concern, i.e., when researchers aim at identifying the minimum number of factors accounting for the maximum variance present in the original set of variables (Hair, Black, Babin, & Anderson, 2010), as in the present analysis. Based on the extracted factors summarizing the information contained in the initial set of variables, we then grouped the regions in clusters.

Also because of changes in the Italian CIS questionnaire, the variables we used in the factor analysis is just partly overlapping with those used in Evangelista *et al.* (2002), but analyze similar characteristic. In particular, we investigate both firm's innovative performance and characteristics and the overall regional and systemic performance. More specifically, we account for variables measuring firm's effort to introduce innovation, namely the percentage of firms that perform R&D (*R&D)* and that perform it on a continuous basis (*R&D-CONT)* and the average R&D investments (*R&D-INT*), measured as the ratio between the costs devoted to R&D activities and the turnover of the firm. Furthermore, as a proxy for the firm innovation strategy we use a variable measuring the importance of innovation strategies aiming at replacing products being phased out (*OBJREP)*. As a measure of the presence of innovative firms in the region, we use different proxies for the diffusion and the relevance of innovation, considering product or service (*PRODUCT*), process (*PROCESS*) and organization innovations (*ORGANIZATION)*; the higher the diffusion of each of those innovations, the higher the diffusion of innovation capabilities in the region. Furthermore, in order to measure to what extent firms are able to deal with different types of innovation at a time, we use the variable *INNO-TYPES,* which measures the average typologies of innovation introduced among the three mentioned above plus the marketing innovation, valuing therefore from 0 (no innovation introduced) to 4 (having introduced at least one innovation of all four typologies). Not all the innovations are equal: some are incremental or improvements already developed and adopted in the industry but not at the firm, whereas others are complex and breakthrough. The CIS survey dataset allow to distinguish for those different levels of innovativeness thanks to a question asking for the introduction of products that are new-to-market (vs. new-to-firm): we use this variable as a proxy for the quality of the firm's innovation effort. More precisely, the variable *NTM* reports the percentage of firms having introduced any new-to-market product innovation, whereas *NTM-TURN* report the regional average turnover from those products with respect to the overall firms' sales, which captures also the relevance of innovative products for the firm's portfolio. Finally, as a measure of the presence and the relevance of interactions among firms and institutions present in the region,

we included variables measuring if the firms cooperated on innovation with supply chains partners, both suppliers (*COOP-SUP*) and clients (*COOP-CLI*), with knowledge intensive business services (*COOP-KIBS*) and finally with universities (*COOP-UNI)*. Despite being private company, often of small dimensions KIBS may have a very important role in RIS, given their knowledge production, transformation and diffusion activities (Muller, Zenker, 2001). Even if the survey does not report where such partners are located, we assume, as Evangelista and colleagues, that they are located within the same region of the firm, so that they may be considered as a proxy for the existence of a systemic dimension of innovation. This hypothesis is easily verified when it comes to vertical relations (suppliers and clients) given that many firms in Italy operates within an industrial district context, but also as far as KIBS are concerned, given that many of those service firms, which often interact mainly with local customers. Unfortunately, this wave of the CIS survey does not allow studying the obstacles to innovation and the technological attractiveness of regions, which were included as additional indicators of the systems' performance in Evangelista *et al.* (2002). Of course, more informal and occasional interactions can take place among regional innovative actors other than formal cooperation, which we measure for, but we opted for a conservative measure of the systemic interactions in the regions.

*Table 3: The variables used in the factor analysis*

| Acronym | Variable description |
|---|---|
| R&D | % firms that perform R&D |
| R&D-CONT | % of firms that perform R&D on a continuous basis |
| R&D-INV | Average R&D investments |
| OBJREP | % of firms attributing no importance to replacing products being phased out |
| PRODUCT | % of product or service innovators |
| PROCESS | % of process innovators |
| ORGANIZATION | % of organization innovators |
| INNO-TYPES | Average types of innovations introduced |
| NTM | % of firms that introduced NtM products |
| NTM-TURN | Average turnover of new-to-market (NtM) products |
| COOP-SUP | % firms cooperating with suppliers |
| COOP-CLI | % firms cooperating with clients |
| COOP-KIBS | % firms cooperating with KIBS |
| COOP-UNI | % firms cooperating with universities |

Table 3 lists all the variables used and their description, whereas Table 4 reports the results of the factor analysis, computed on the indicators listed. Three factors were extracted, being the only ones that have an eigenvalue greater than 1; they explain altogether the 78% of the total variance of the original 14 variables considered. Table 5 reports the rotated factor matrix, which allow better interpreting the meaning of each of the three factors hat we named:

1. innovativeness
2. structured research
3. systemic interactions

The first factor, which explains the highest percentage of the total variance of the variable considered, measures the innovation performance of the region. Indeed, this factor is strongly

related with the variables capturing the rate of diffusion of product (*PRODUCT*), process (*PROCESS*) and organization innovations (*ORGANIZATION*) in the region and the multifaceted approach of firm toward innovation (*INNO-TYPES*). This factor is also positively related to the diffusion of new to market innovations and the importance of such innovations for the overall firm's turnover (*NTM, NTM-TURN*). Finally, this first factor relates also to the propensity of firms to define an innovation strategy aimed at replacing existing objects (*OBJREP*). The second factor explains the regional technological competences and the private R&D effort of firms. In fact, it correlates with the variables measuring the firm's internal effort to develop innovation and the measures of the stock of its technological capabilities. Other than with the percentage of the regional firms that performs R&D activities in-house (*R&D*), such variable correlates with the percentage of those that have a department devoted to develop new products and ideas (*R&D-CONT*) and with the amount of resources devoted to such activities (*R&D-INT*). This factor is likely to measure the formalized innovative activities taking place within the region, together with firms' ability to deal with standards and codified knowledge. Finally, the third factor, which explains a percentage of the variance close to that of the second factor (16% vs. 17%), is linked with the systemic dimension of innovation, rather than on the firms' capabilities and innovative performance. This factor, in fact, is positively related with the importance of all the external partners considered as source of information and partners for developing new product and processes, including supply chain partners (*COOP-SUP* and *COOP-CLI*) and knowledge providers, namely consultants, commercial labs or private R&D labs (*COOP-KIBS*) and universities*, (COOP-UNI*). It is interesting to notice, tough, that the variable indicating interactions with universities has a lower loading than the others: while KIBS could be assimilated to suppliers, cooperation with universities may, in fact, entail more complex knowledge exchanges and absorptive capacity on the firm's side.

*Table 4: Results of the factor analysis*

| | Factor 1 | Factor 2 | Factor 3 |
|---|---|---|---|
| Eigenvalue | 6.29 | 2.44 | 2.18 |
| % of variance explained | 0.45 | 0.17 | 0.16 |
| Cumulative % | 0.45 | 0.62 | 0.78 |

*Table 5: Rotated factor matrix (n=6,168; rotation method: varimax)*

| | **Factor 1: Innovativeness** | **Factor 2: Structured research** | **Factor 3: Systemic interactions** | **Uniqueness** |
|---|---|---|---|---|
| PRODUCT | **0.98** | 0.06 | 0.00 | 0.04 |
| PROCESS | **0.98** | 0.05 | 0.00 | 0.03 |
| ORGANIZATION | **0.95** | 0.04 | 0.00 | 0.10 |
| INNO-TYPES | **0.98** | 0.06 | 0.00 | 0.03 |
| NTM-TURN | **0.94** | 0.06 | 0.01 | 0.11 |
| NTM | **0.98** | 0.06 | 0.00 | 0.04 |
| OBJREP | **0.81** | 0.05 | -0.04 | 0.35 |
| R&D | 0.00 | 0.01 | **0.80** | 0.36 |
| R&D-INV | -0.02 | 0.03 | **0.74** | 0.44 |

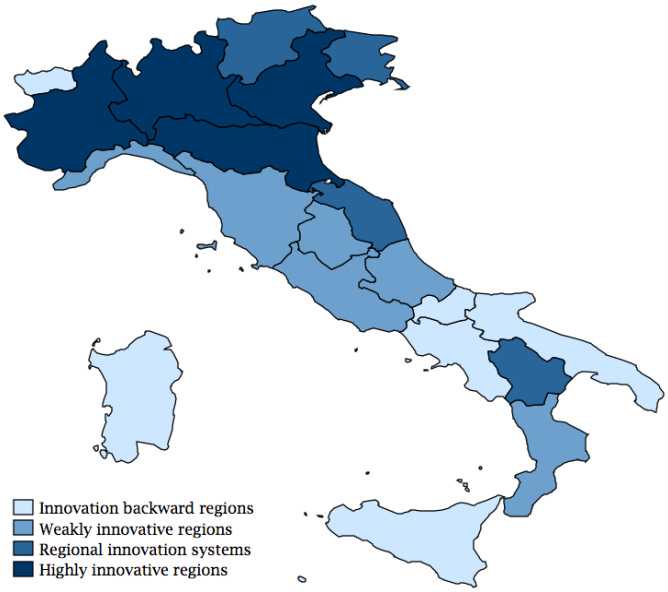
| | | | | |
|---|---|---|---|---|
| R&D-TURN | 0.01 | 0.09 | **0.79** | 0.36 |
| COOP-SUP | -0.01 | 0.19 | **0.59** | 0.61 |
| COOP-CLI | 0.07 | **0.92** | 0.05 | 0.14 |
| COOP-KIBS | 0.10 | **0.89** | 0.00 | 0.20 |
| COOP-UNI | 0.08 | **0.85** | 0.10 | 0.26 |

Based on the three factors identified above, we then performed a cluster analysis, using the method of the agglomerative hierarchical cluster analysis, which start by identifying one cluster for each region and then group them iteratively using the criteria of the complete linkage method, the same methodology used also in Evangelista *et al.* (2002). The analysis allowed identifying the four following clusters (represented in Figure 1):

- *Highly innovative regions*, including Veneto, Emilia-Romagna, Piemonte and Lombardia;
- *Regional innovation systems,* constituted by Friuli-Venezia Giulia, Trentino Alto Adige, Marche and Basilicata;
- *Weakly innovative regions,* composed by Liguria, Abruzzo, Toscana, Umbria, Lazio and Calabria; and
- *Innovation backward regions,* including all the remaining regions, namely Valle D'Aosta, Campania, Molise, Puglia, Sardegna and Sicilia.

In the following, we will describe each cluster: Table 6 summarizes the main characteristics of each of the four cluster identified and ranked by their relative innovation performance (factor 1 – innovativeness).

*Figure 1: The emerging clusters*




### *6.1 Highly innovative regions*

The most innovative regions in Italy – Veneto, Emilia-Romagna, Lombardia and Piemonte – belong to this group: on average almost half of the firm located in those regions have introduced at least one innovation. Moreover, such regions are characterized by the highest

diffusion of private R&D activities. It is characterized by the highest investments in R&D and the largest share of firms that, when conducting such activity, has a dedicated office or personnel (62.8% vs. 47.5% of the low innovative regions). As compared to the other groups, in such regions the average size is bigger (28 employees vs. the 24 characterizing the other groups). This result is in line with previous evidence on the largest presence of medium-sized firms not only as far as the Northwestern regions are concerned, but also about the Northeastern ones. In fact, Northeastern regions and Veneto in particular, are the regions where the incidence of medium-sized firms is highest and has grown the most during the period 2000-2008 (see De Marchi, Grandinetti, 2012). Interestingly, firms located in those regions does not appear to interact strongly with other innovative actors within the regions: actually just 14.3% of firms in this group interact with other firms or institutions, the same percentage characterizing the innovation backward regions. Interestingly, the highest difference with respect to the other clusters regard the cooperation with universities and KIBS, despite the presence of a good public scientific and technological infrastructure, which characterize all the regions, which host several of the most prestigious universities in Italy, and the most active in terms of spin-off generated and new inventions patented according to Netval, 2011). When they do interact, they not necessarily prefer local partners: it seems rather that is the group where firms are better able to tap into global flows of knowledge and cooperate within global value chains. In fact, this is the group of regions that, together with the RIS one, has the highest share of firms that, when collaborating with external partners, does it also with foreign ones. In addition, those regions represent also a very low percentage of firms that took advantage by policy supporting innovation at the local or regional level: just 17.8% of the firms received any subsidy or any other form of support by public authorities, a percentage that is almost half than the group of RIS (34.2%).

Given that there is a strong entrepreneurial component in innovation, in terms of the capabilities of single firms to invest in innovation and realize new product or processes, but a weaker institutional component, considering both for knowledge providers and policy aimed at supporting innovation, it seem not possible to qualify such regions as Regional Innovation Systems. Rather, it seems they represent a peculiar yet interesting path toward innovation, different from what has been suggested in the RIS literature so far, but effective in generating and diffusing innovation.

### *6.2 Regional innovation systems (RIS)*

The second group of regions identified by the cluster analysis, which entails regions from the North, the Center and the South of Italy, instead, can be defined Regional Innovation System; more precisely, it resembles closely the type of RIS defined in the literature as *regionally networked innovation system*. Similarly to the first, this cluster is characterized by a good

propensity to innovate, with 44.2% of firms having introduced at least one innovation in the period 2006-2008 and scoring above the national average especially as far as process and marketing innovations are concerned, but being characterized by a strongest systemic and institutional component. What it mostly peculiar about those regions is the high incidence of firms that cooperate with external partners for innovation (17.3%), much higher than all the other groups. Firms in those regions are embedded in a dense network of partners that support and complement their innovative effort, being both supply chain partners like suppliers (which is the case for 55.7% of the firms that cooperate) but also with knowledge providers, both private (KIBS) or public (universities). Actually, almost one third of the firms that co-innovative with external partners engage in cooperation with universities, which seems a very high percentage given the weak industry-university connection characterizing Italy as a whole, as compared to other countries. Moreover, in those regions the incidence of firms benefiting from public support to innovation is the highest (34.2% vs. the national average, 18.6%). The presence of two regions with a particular form of autonomy ("a statuto speciale") – Friuli-Venezia Giulia e Trentino Alto Adige– may, at least partly, motivates such result. The fact that Basilicata (usually regarded as backward technological regions) is part of this cluster, having the lowest level of the factor "structured research" but similar in terms of "innovativeness" and "systemic interactions", is puzzling, even if a similar result was found also by Evangelista *et al.* (2002). If such authors suggest that this result may be driven by the low number of firms in the region, which may bias the analysis, it is also possible, given the consistency along the two studies, that the region is characterized by a small yet dynamic group of innovative firms, well supported by the local institutional environment. Further in-depth studies should be performed to better comprehend such result.

### *6.3 Weakly innovative regions*

The productive structure of the regions of the third cluster, entailing mainly regions located in the center of Italy plus Liguria and Calabria, has a low innovative content. Just 40% of the firms innovate, being weak especially as far as the introduction of technological innovation is concerned. Furthermore, such regions are characterized by a lower stock of internal technological competences, investing, and engaging in R&D activities on an occasional basis in almost half of the times. Also the institutional context and the systemic interactions are very weak, with the exception of the cooperation with universities; almost one firm out of four of those that cooperate engage in co-innovation with universities, suggesting the existence of some interactions taking place between local firms and knowledge institutions. Lazio is a case in point at this regard: according to ISTAT data, 25.1% of the overall R&D expenses of the region are linked with universities and 39.1% with public institutions, confirming the important role of such organizations for the regional innovation effort. All in

all, even tough those regions are characterized by some innovative firms or public institutions, it seems that there are not sufficient systemic interactions nor high innovative output to qualify them as regional innovation systems.

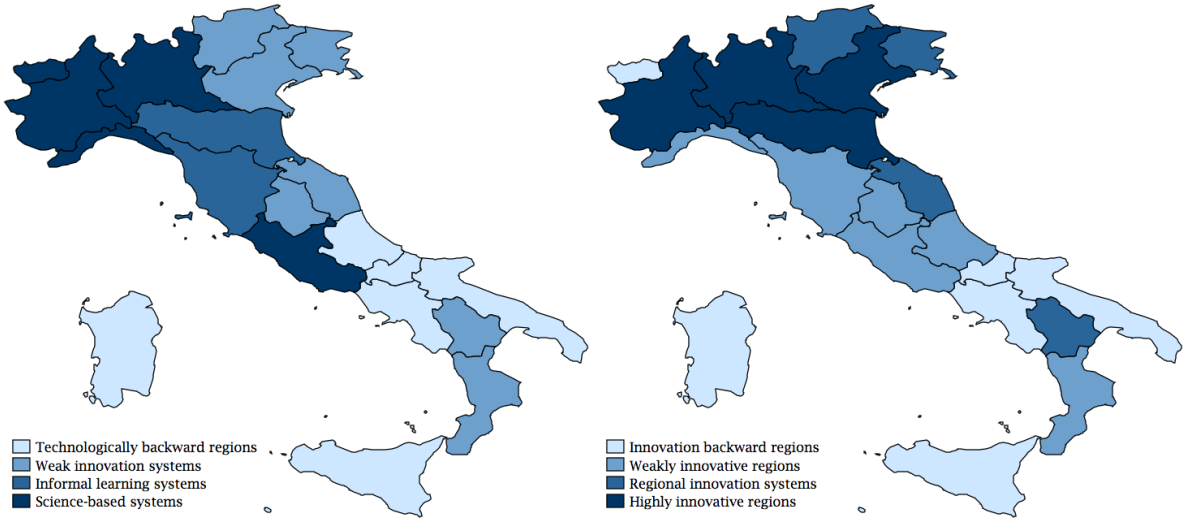
### *6.4 Innovative backward regions*

The last cluster is characterized by the lowest level of innovativeness, structured research and systemic interactions. Despite characterized by an average firm size – similar to that characterizing the RIS cluster – such regions have a much lower propensity to introduce new products, processes, organization or marketing innovations: just 37.6% of the firms introduced at least one innovation. The only characteristics for which they have average performance is the incidence of firms that cooperated for innovation – 14.3%, as the first cluster analyzed – and the incidence of firms that enjoyed local public support to innovation activities, almost one firm out of four, much higher than the national average. Those results can be interpreted with the fact that those regions – that we named innovative backward regions, following the wording by Evangelista and colleagues – are mainly located in the South of Italy, the Italian macro-area characterized by the poorest knowledge infrastructures and by a more sparse entrepreneurial tissue, an area that is very dependent on the public system (see also Iammarino, 2005). Valle D'Aosta is the only exception, being located in the Northwest. It is relevant noting that Molise is the most dissimilar to the other regions, having very high values for the factor structured research, but very low as innovativeness, which again may be explained with the very low number of firms part of this cluster.

*Table 6 – The main characteristics of the four clusters*

| | **Highly innovative** | **RIS** | **Weakly innovative** | **Innovative backward** |
|---|---|---|---|---|
| Average employees (2008) | 27.74 | 24.82 | 24.10 | 24.09 |
| Have introduced at least one innovation (%) | 49.1% | 44.2% | 40.0% | 37.6% |
| Types of innovation (%) | 1.07 | 0.96 | 0.81 | 0.75 |
| Cooperation for innovation | 14.3% | 17.3% | 13.6% | 14.3% |
| *- with foreign partners* | *27.8%* | *27.1%* | *20.2%* | *6.6%* |
| *- with suppliers* | *48.3%* | *55.7%* | *45.2%* | *33.5%* |
| *- with KIBS* | *39.1%* | *50.6%* | *38.7%* | *27.7%* |
| *- with universities* | *24.0%* | *31.0%* | *24.9%* | *21.0%* |
| R&D expenditures | 26,622 | 15,491 | 11,885 | 6,497 |
| R&D on continuous basis | 62.8% | 57.0% | 54.8% | 47.5% |
| Public support (local or regional) | 17.8% | 34.2% | 16.7% | 25.6% |

*Figure 2: A comparison of the cluster of innovative regions as emerging in the 1990s (left), as reported in Evangelista et al. (2002), and in the late 2000s (right), as emerging in the current analysis. The darker the blue, the higher the innovative capabilities of the region*




## 7 Concluding remarks

In this analysis, by the mean of data from the latest Community Innovation Survey, we analyzed the innovative performance and verified the existence of regional innovation systems (RIS) in the Italian context. By mimicking the methodological and analytical approach used in the only previous study that attempted to quantitatively identify RIS in the Italian context but using data on the early nineties, our analysis, based on 2008 data, provide also a useful instrument to evaluate the dynamic evolution of innovation capabilities of Italian regions.

The overall framework on innovative capabilities of Italian regions emerging from our analysis is rather interesting and novel, with respect to what has been identified so far in the literature. In particular, the emerging analysis challenges the traditional view of Italy as characterized by three different areas, the so-called "three Italys model" (North-West, Center and North-East and the South), which has represented the Italian economy in the recent past (Malerba 1993, Iammarino 2005). According to such model – which was develop to explain the heterogeneous economic and growth performance of Italian regions but has been applied also to describe pattern of innovation and innovation performance – Northwestern regions were the only RIS in Italy, as opposed to the backward southern regions and the central and Northeastern regions, which were considered "learning regions" and where "knowledge flows and systemic interactions in innovation take the form mainly of inter-firm user – producer interactions, which are particularly dense in those industrial areas organized as districts" (Iammarino, 2005, p. 510). By the mean of a cluster analysis based on data of innovative activities and performance of Italian firms during the late 2000s, we identified four clusters: highly innovative regions, regional innovation systems, weakly innovative regions and

innovation backward regions. Such cluster classification is just partly overlapping with that identified by Evangelista *et al.* (2002): interesting differences emerge, which suggest a changed geography of innovation in Italy. Veneto and Toscana are the regions that showed the strongest change as compared to the picture emerging in that earlier analysis (see also Figure 2). Veneto, being part of the weak innovation systems and described as a moderately innovative region, entered rather the group of most innovative regions, being characterized by almost half of firms that have introduced innovations. On the contrary Toscana, described as highly innovative even if with lower R&D investments and formal innovation activities, passed into the group of weakly innovative regions, being characterized by medium-low levels of diffusion of all the type of innovations considered (product, process, organizational and marketing). Also the innovative performance of Liguria showed a steep reduction, getting one of the least innovative regions.

The most important result of our analysis is that the so-called "Third-Italy", which was composed by central regions (Umbria, Toscana and Marche) and Northwestern ones (Emilia-Romagna, Veneto, Friuli-Venezia Giulia), does not exist anymore as a peculiar territorial development model. Two regions that were part of this group (Veneto and Emilia-Romagna) are now part of the most innovative group, together with Lombardia and Piemonte, whereas Umbria and Toscana – indeed the setting of most of the studies that in the 1980s and 1990s celebrated the Third Italy in the international literature – followed a completely opposite path, moving to the group of regions with just weak innovative capabilities. The end of the Third Italy model correlates with the crisis of Marshallian industrial districts, the backbone of that model, but its outcomes have not been equal across all regions. Just as far as the two Northeaster regions are concerned it seems that an evolutionary crisis have taken place, since the component of medium and medium-large sized firms being highly dynamic, innovative and competitive in international markets got increasingly reinforced and firms showed increasing capabilities to deal with and develop complex knowledge, also interacting with foreign innovative actors (De Marchi and Grandinetti, 2012).

Another interesting contribution emerging from our analysis regards the relationship between innovation performance and the systemic character of innovative activities, as embedded in the RIS concept. On the one hand, the most innovative Italian regions cannot be interpreted through the RIS paradigm, as they have been defined in the literature, since they do not distinguish themselves for a strong systemic and interactive character of innovative activities or for a relevant presence of institutions (universities, public research centers and regional government policy). The most important and distinctive ingredients of RIS are therefore missing (Cooke *et al.*, 1997; Tödtling and Trippl, 2011). On the other hand, Italian regions that correspond to the RIS model are not the ones that show the best innovative performance, considering for both technological and non-technological innovations. It is evident that our results challenge the concept of RIS itself and we believe that the extent of

such result exceeds the specific Italian case. If so far, as suggested by Asheim *et al.* (2011), the existing literature on RIS focused just on few exemplary cases of regions where innovation resulted by the systemic interactions and the positive relationships among firms and institutions, it is well possible, then, that the universe of regions – within and outside Europe – may be characterized by models that go beyond the RIS/non-RIS dichotomy and the intermediary typology of "learning regions" (Iammarino, 2005), "grassroots RIS" (Cooke, 1998), or "territorially embedded RIS" (Asheim and Isaksen, 2002), to quote the labels used in the literature. Do Italian regions that are highly innovative but do not resemble "typical RIS" neither "grassroots" or "territorially embedded RIS" correspond to a novel regional innovation pattern that might be found also in other countries? A similar question could apply if considering regions in which the second sub-system (institution) as defined by Tödtling and Trippl (2011) is strong, yet the impact of its actions on the second subsystem (firms) is lower than what could be expected. In our opinion, addressing such questions, together with refining the analysis adding different dimension for systemic interactions, could be an important avenue of future research.

**Acknowledgement**

The authors would like to thank the Adele Laboratory at ISTAT, where the elaborations have taken place, for the provision of the CIS data.

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ABSTRACT

The literature on the regional innovation systems (RIS) has suggested that the region is the level at which innovation is produced and have suggested that the deep differences in innovation performance among regions may be explain by the peculiar combination of firm's strategies and charateristics together with the institutional framework, the role of public policies and research institutions and the nature of their relationships. Despite the literature on RIS have flourished since the concept was first developed in the 1990s, contributions that attempted to evaluate quantitatively which regions can be considered RIS are still very scant, whereas the great majority of the studies on the topic so far have rather adopted a qualitative approach, studying single exemplary regions.

By the mean of a cluster analysis on the latest Community Innovation Survey (CIS) data, we analyzed the innovative performance and verified the existence of regional innovation systems (RIS) in the Italian context. By mimicking the methodological and analytical approach used in the only previous study that attempted to quantitatively identify RIS in the Italian context but using data on the early nineties, our analysis, based on 2008 data, provide also a useful instrument to evaluate the dynamic evolution of innovation capabilities of Italian regions. The analysis indicates that not only the North-South dichotomy but also the Third-Italy model are not able to describe innovation performance of Italian regions anymore, suggesting a rather new geography of regional patterns in Italy, with Veneto and Emilia assimilated to the traditionally most R&D intense regions (Lombardia and Piemonte) while Toscana displaying much lower innovative performance. Four cluster of regions are identified, but only one can be described as a RIS. The emerging results challenge also our understanding of RIS. In fact, the most innovative regions cannot considered RIS and regions that correspond to the RIS model are not the ones that show the best innovative performance.